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APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/064,605	07/30/2002	Ronald Scott Bunker	124626-1	6850

6147 7590 06/01/2004

GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
PATENT DOCKET RM. BLDG. K1-4A59
SCHENECTADY, NY 12301-0008

EXAMINER	
ALEJANDRO, RAYMOND	

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 06/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

CF

Office Action Summary	Application No.	Applicant(s)	
	10/064,605	BUNKER, RONALD SCOTT	
	Examiner	Art Unit	
	Raymond Alejandro	1745	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 February 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-9 and 11-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-9 and 11-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *02/02/04*.
4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____.

DETAILED ACTION

Response to Amendment

This action is submitted in response to the amendment filed 02/02/04. The applicant has overcome the objections and the 35 USC 102 rejection. Refer to the abovementioned amendment for specific details on applicant's rebuttal arguments. However, the claims are finally rejected over art as seen below and for the reasons of record:

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 02/02/04 was considered by the examiner.

Drawings

2. The drawings were received on 02/02/04. These drawings are acceptable.

Specification

3. The disclosure is objected to because of the following informalities: the amendment to the specification (see page 2 of the amendment of 02/02/04) is incorrectly replacing paragraphs 0016 and 0017, in that, it is noted that the text body of the amended paragraphs correspond to paragraphs 0015 and 0016 of the original specification. Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

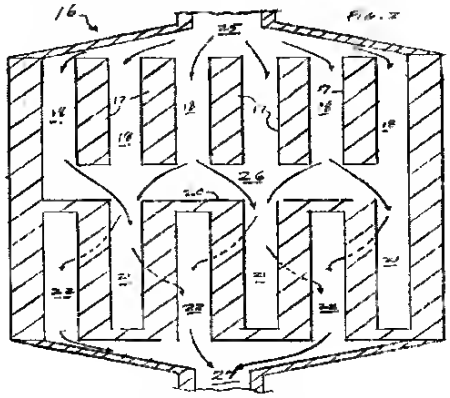
6. Claims 1-2, 4-9 and 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Margiott 2002/0086200 in view of Wu et al 2002/0026999.

The present application is directed to an apparatus for fuel cell components wherein the disclosed inventive concept comprises the specific flow field plate structural arrangement. In addition, other limitations include the fuel cell components; the plurality of concavities and their shape; the flowing fluid; the upper-bottom ribs disposing angle; and the fuel cell per se and the specific fuel cell.

With respect to claims 1 and 7:

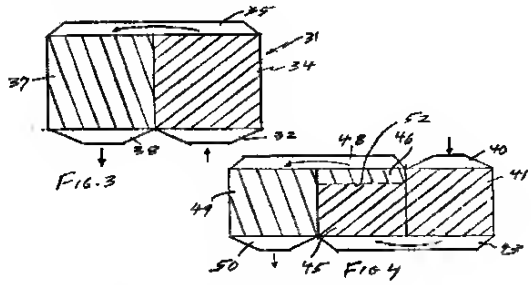
Margiott teaches a fuel cell with a reactant flow field plate comprising an inlet and an outlet; a plurality of flow-through flow field channels; a plurality of interdigitated flow field channels; and a flow transition for directing flow between said flow-through channels and said interdigitated channels, said channels and said transition extending between the inlet and the outlet (CLAIM 1).

Figure 2 below depict the flow field plate comprising a base plate; and first and second side plate structurally connected to the ends of the base plate. The base plate includes ribs 17 defining flow-through flow field channels 18, and a serpentine rib 20 that defines inlet channels 21 and outlet channels 22 (SECTION 0013). It is also disclosed that the hybrid flow channels may be implemented in a flow field which folded one or more times (SECTION 0006). *Thus, if the channels are folded, the resulting plate structure will have channels laying one over another.*



It is also disclosed that the hybrid flow channels may be implemented in a flow field which folded one or more times (SECTION 0006). *Thus, if the channels are folded, the resulting plate structure will have channels laying one over another.*

Figures 3-4 below illustrate the flow field plate in a folded configuration in which the oxidant enters through an inlet manifold 32, passes through a portion 34 of the plate having channels, then is turned by a flow reversing manifold 35 so as to flow through a portion 37 of the plate 31 which also has channels (SECTION 0014). In particular, Figure 4 shows the transition between the portions 34 and 37 not a the manifold 35 but mid-way between the manifold 35 and either of the manifolds 32 or 38 (SECTION 0014).



depending upon other parameters. In **FIG. 3**, a fuel cell reactant flow field plate **31** is shown in a folded configuration in which the oxidant enters through an inlet manifold **32**, passes through a portion **34** of the plate **31** which has flow-through reactant flow field channels, then is turned by a flow reversing manifold **35** so as to flow through a portion **37** of the plate **31** which has interdigitated reactant flow field channels, after which the reactant flows through an exit manifold **38** to exhaust. However, the transition between the portions **34** and **37** need not occur at the manifold **35**, but may be mid-way between the manifold **35** and either of the manifolds **32**, **38**, as is illustrated in **FIG. 4**. Therein, the reactant flows through an inlet manifold **40**, through a first portion **41** which comprises flow-through reactant flow field channels, through a reversing manifold **43** and a second portion **45** which has flow-through reactant flow field channels, and thence through a portion **46** which has interdigitated reactant flow field channels, through a reversing manifold **48** and a portion **49** which has interdigitated flow field channels, and thence through an exit manifold **50** to exhaust. The transition **52** between the flow-through channels and the interdigitated channels may be located anywhere between the manifolds to suit any utilization of the present invention.

Hence, Margiott's flow field plate comprises a plurality of upper ribs and a plurality of bottom ribs forming top channels and bottom channels in the flow field plate per se to allow a flow of fluid to alternate between the top channels and the bottom channels.

With respect to claims 2 and 9:

Margiott teaches the fuel cell components anode, the cathode and the electrolyte (SECTION 0002).

With respect to claims 3-4 and 10-12:

Margiott also discloses a plurality of ribs 17 that project from the flow field plate and form recesses or indentations on the plate surface (SECTION 0013/ FIGURE 2). *Therefore, the ribs themselves also act as the claimed concavities.*

With respect to claims 5 and 13:

Margiott additionally teaches the reactants being hydrogen or a hydrogen-rich fuel and an oxygen or air oxidant (SECTION 0002).

With respect to claims 6 and 14:

***Figures 3-4** above illustrate flow fluid plates in folded configurations wherein the flow reversing manifold or the transition between the plate portions and the flow-through flow field channels and the interdigitated flow field channels are disposed at the angle of substantially 90 degrees to provide the turns or reversing manifolds.*

As to claim 8:

Margiott teaches alkaline, acid or solid polymer electrolyte fuel cells (SECTION 0002).

Margiott discloses a cooling device for a fuel cell according to the foregoing details. However, Margiott does not expressly disclose the specific plurality of concavities.

With respect to claims 1, 4, 7, 11 and 15-16:

Wu et al discloses a heat exchanger plate (TITLE) comprising a plurality of spaced-apart dimples 162 and 164 formed in the plate planar central portion 70. The dimples 162, 164 are located to be in registration in juxtaposed first and second plates, and are thus joined together to strengthen the plate pairs; the dimples also function to create flow augmentation between the plates (SECTION 0050/ FIGURES 15-16). Figures 15-16 illustrate the concavities having a

substantial spherical shape (circular shape and depth). *The hydrodynamic interactions and heat transfer characteristic are inherent to the specific concavity structural shape.*

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the specific plurality of concavities of Wu et al in the cooling device of Margiott because Wu et al disclose that the specified dimples are joined together to strengthen the plate pairs; and to create flow augmentation between the plates. *Thus, the flow augmentation per se enhance the heat transfer properties of the plate. It is also noted that the two references are pertinent to each other as they both address the same problem of providing suitable heat transfer plates for fluid flow purposes.*

7. Claims 1-2, 4-9 and 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Margiott 2002/0086200 in view of Thonon et al 5806584.

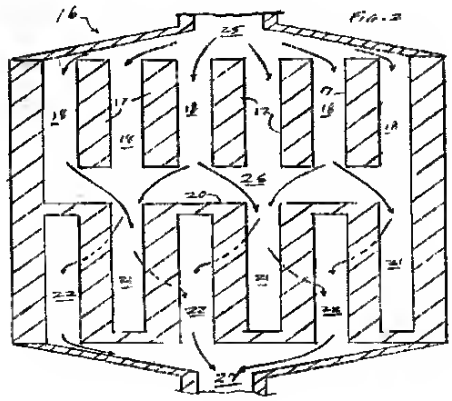
The present application is directed to an apparatus for fuel cell components wherein the disclosed inventive concept comprises the specific flow field plate structural arrangement. In addition, other limitations include the fuel cell components; the plurality of concavities and their shape; the flowing fluid; the upper-bottom ribs disposing angle; and the fuel cell per se and the specific fuel cell.

With respect to claims 1 and 7:

Margiott teaches a fuel cell with a reactant flow field plate comprising an inlet and an outlet; a plurality of flow-through flow field channels; a plurality of interdigitated flow field channels; and a flow transition for directing flow between said flow-through channels and said

interdigitated channels, said channels and said transition extending between the inlet and the outlet (CLAIM 1).

Figure 2 below depict the flow field plate comprising a base plate; and first and second side plate structurally connected to the ends of the base plate. The base plate includes ribs 17 defining flow-through flow field channels 18, and a serpentine rib 20 that defines inlet channels 21 and outlet channels 22 (SECTION 0013). It is also disclosed that the hybrid flow channels may be implemented in a flow field which folded one or more times (SECTION 0006). *Thus, if the channels are folded, the resulting plate structure will have channels laying one over another.*



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between the portions 34 and 37 not a the manifold 35 but mid-way between the manifold 35 and either of the manifolds 32 or 38 (SECTION 0014).

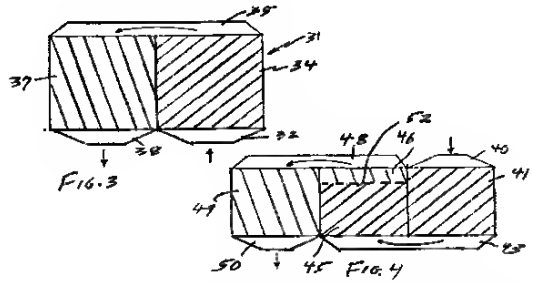

FIG. 3 FIG. 4

depending upon other parameters. In **FIG. 3**, a fuel cell reactant flow field plate **31** is shown in a folded configuration in which the oxidant enters through an inlet manifold **32**, passes through a portion **34** of the plate **31** which has flow-through reactant flow field channels, then is turned by a flow reversing manifold **35** so as to flow through a portion **37** of the plate **31** which has interdigitated reactant flow field channels, after which the reactant flows through an exit manifold **38** to exhaust. However, the transition between the portions **34** and **37** need not occur at the manifold **35**, but may be mid-way between the manifold **35** and either of the manifolds **32, 38**, as is illustrated in **FIG. 4**. Therein, the reactant flows through an inlet manifold **40**, through a first portion **41** which comprises flow-through reactant flow field channels, through a reversing manifold **43** and a second portion **45** which has flow-through reactant flow field channels, and thence through a portion **46** which has interdigitated reactant flow field channels, through a reversing manifold **48** and a portion **49** which has interdigitated flow field channels, and thence through an exit manifold **50** to exhaust. The transition **52** between the flow-through channels and the interdigitated channels may be located anywhere between the manifolds to suit any utilization of the present invention.

Hence, Margiott's flow field plate comprises a plurality of upper ribs and a plurality of bottom ribs forming top channels and bottom channels in the flow field plate per se to allow a flow of fluid to alternate between the top channels and the bottom channels.

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As to claim 8:

Margiott teaches alkaline, acid or solid polymer electrolyte fuel cells (SECTION 0002).

Margiott discloses a cooling device for a fuel cell according to the foregoing details. However, Margiott does not expressly disclose the specific plurality of concavities.

With respect to claims 1, 4, 7, 11 and 15-16:

Thonon et al disclose a heat exchanger plate (TITLE) provided with hollows 14 in order to reduce pressure drops (ABSTRACT/ COL 2, lines 61-67) wherein the hollows 14 are concave reliefs in the channel (COL 3, lines 1-5). Thonon et al disclose that the specified hollows provided on the plate assist in reducing pressure drops and disturb the flow of fluids to increase heat transfers through the plates (Abstract/ COL 1, lines 5-12). As evident from Figure 3, the hollow 14 has a semicircular shape and a depth, thus, it can be considered to have a

hemispherical shape. *The hydrodynamic interactions and heat transfer characteristic are inherent to the specific hollow (concavity) structural shape.*

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the specific plurality of concavities of Thonon et al in the cooling device of Margiott because Thonon et al disclose that the specified hollows provided on the plate assist in reducing pressure drops and disturb the flow of fluids to increase heat transfers through the plates. *Hence, the disturbance of fluid flow itself enhances the heat transfer properties of the plate. It is also noted that the two references are pertinent to each other as they both address the same problem of providing suitable heat transfer plates for fluid flow purposes.*

Response to Arguments

8. Applicant's arguments, see the amendment filed 02/02/04, with respect to the rejection of claims 1-2, 4-9 and 11-16 have been fully considered and are persuasive. Therefore, the rejection has been overcome. However, upon further consideration, a new ground(s) of rejection is made as seen above. Thus, applicant's arguments are moot in view of the new grounds of rejection.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro
Examiner
Art Unit 1745